

WHAT IS CLAIMED IS:

1. A multi-step landing micro-mirror, comprising:

a trench formed in a substrate and having N-1 steps in one side wall thereof;

N plates rotated in or on said trench; and

2N springs for connecting said plates to each other;

wherein said N plates are composed of an outermost first plate, a second plate connected with said first plate by the spring and located in said first plate, ..., and a N-th plate connected with a (N-1)-th plate by the spring and located in said (N-1)-th plate,

wherein when voltages are applied to said N plates and said trench, respectively, said first plate is subjected to a first landing with a predetermined displacement angle on a first step of said trench due to the electrostatic force, said second plate is subjected to a second landing with the predetermined displacement angle on a second step of said trench, ..., said N-th plate is subjected to a N-th landing with the predetermined displacement angle on the other side wall of said trench.

2. The multi-step landing micro-mirror according to claim 1, wherein the first plate, the second plate, ..., and the (N-1)-th plate among said N plates have a rectangular ring shape.

3. The multi-step landing micro-mirror according to claim 1, wherein said N-th plate is the mirror having a rectangular shape.

4. The multi-step landing micro-mirror according to claim 1, wherein said $2N$ springs have a meander type, a torsion beam type, or a complex type of them.

5. The multi-step landing micro-mirror according to claim 1, wherein the sum total of the rotation angle of said first landing, the rotation angle of said second landing, ..., and the rotation angle of said N -th landing is 90 degree.

6. A method for manufacturing the multi-step landing micro-mirror according to claim 1, comprising the steps of:

(a) forming a trench having $N-1$ steps formed in one side wall thereof in a substrate;

(b) forming a first insulating film in and on said substrate;

(c) depositing and patterning a conductive film in and on said substrate to form an electrode layer in and around said trench;

(d) forming a second insulating film in and on the substrate;

(e) attaching a silicon layer on and around said trench; and

(f) etching said silicon layer to form N plates and $2N$ springs.

7. The method for manufacturing the multi-step landing micro-mirror according to claim 6, wherein said substrate is a glass or a silicon substrate.

8. The method for manufacturing the multi-step landing micro-mirror

according to claim 6, further comprising the step of polishing said silicon layer to have a thickness in the range of 50 to 620 μ m, after the step (e).

9. A multi-step landing micro-mirror array, wherein the multi-step landing micro-mirrors according to claim 1 are arranged on a same plane in a $m \times n$ matrix shape to obtain a plurality of the reflective light beams with respect to an incident light.